NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

MILKHOUSE WASTEWATER INFILTRATION AREA

(Each)

CODE 719

DEFINITION

A component of a waste management system that will reduce or remove pollutants from milking center wastewater through a variety of processes.

PURPOSE

To improve water quality by reducing the environmental impacts of milking center wastewater. This is accomplished through the processes of settlement, filtration, infiltration, absorption, adsorption, evaporation, biological reduction and volatilization.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies when it is a component of a comprehensive nutrient management plan and where:

- Wastewater is generated from the washing of equipment associated with milking cows such as; tanks, pipelines, and milking machines. It shall not be used to treat dumped milk or sewage from rest rooms.
- Manure from the animal housing system is handled as a solid or semi-solid.
- Reducing the amount of liquid in a manure storage system is a priority.
- The volume of wastewater does not exceed 300 gallons per day.

CRITERIA

General Criteria Applying to All Facilities

The milkhouse wastewater infiltration area and appurtenances shall be planned, designed, and constructed to meet all federal, state and local laws and regulations, including cultural resources, in compliance with General Manual 420, Part 401.

Components shall be suited for the site conditions. These conditions include vehicular traffic and soil loads, corrosion of materials, floatation of tanks, and frost action.

Odor Trap. An odor trap, such as a plumber's "P-trap", shall be installed in the distribution pipeline before the air vent, between the milking center and settling trap, to prevent odors from entering the building.

Air Vent. A combination vent and surge protection outlet shall be located before the distribution box.

Pipeline. For gravity systems, the pipeline shall have a minimum inside diameter of four inches and be in accordance with Conservation Practice 634, Manure Transfer. Pipe for pump systems shall meet the pump manufacturer's specifications for size and pressure rating. Provide access to the pipeline at appropriate intervals for cleanout. Pipe shall be located at an adequate depth or otherwise protected to avoid damage from vehicles and frost.

Solids Trap. All systems shall have at least two tanks, one settling tank for solids and one grease trap to remove milk fats and other floatable solids. An effluent filter shall be installed at the discharge end of the grease trap.

The capacity of the tanks shall be a minimum of three times the actual daily flow. Tanks shall be water tight, designed not to float and be accessible year-round for periodic cleanout. Cleanout ports shall have risers and secure covers for accessibility and safety.

Pump. A pump shall be used if gravity flow is not possible. The pump station shall have a riser and secure cover for year-round access and safety.

Replacement Area. An area equally sized area adjacent to the absorption bed or trench must be set aside as a replacement area in the event the absorption bed or trench should fail.

Safety. Ventilation and warning signs must be provided for tanks and covered storages to warn of potential explosion, poisoning, and asphyxiation.

Additional Criteria for Absorption Trenches

All absorption trench disposal fields shall comply with all isolation requirements set forth in Table 1.

Table 1. Minimum Setback Distances from Edge of Infiltration Area

Site Features	Setback Distance
Wells with water usage of 2000 GPD or more.	500 Feet
Owner's or Neighbors Wells	300 Feet
Water Supply Lines	25 Feet
Major Water Course (Blue Line on Topo Map)	50 Feet
Minor Water Course	25 Feet
Drainage Ditches	25 Feet
Edge of Wetland	50 Feet
Slope Greater Than 3:1	25 Feet
Building On Grade (Slab)	15 Feet
Build with Basement	35 Feet
Property Lines	25 Feet
Burial Sites or Graveyards	25 Feet

Absorption trenches shall have a maximum width of 48 inches.

The size of an absorption trench is calculated as the bottom area of the trench. The amount of area is calculated based on the second lowest percolation rate in the proposed area of the trench, using the following formula:

$$LR = \frac{3}{\sqrt{t}}$$

where LR is the loading rate in gallons per square foot of absorption trench per day and t equals the percolation rate in minutes per inch. The size of the absorption trench is determined by dividing the design flow in gallons per day by the loading rate in gallons per day per square foot. The result is the number of square feet of bottom area required. The minimum acceptable value for t is 4 minutes/inch and the maximum acceptable value for t is 60 minutes/inch. The maximum loading rate is 1.5 gallons per day per square foot.

Absorption trenches shall extend no deeper than 36 inches below the ground surface.

Absorption trenches may be installed on slopes up to 20%. Sites on slopes greater than 20% will be approved on a case by case basis by the State Conservation Engineer.

When installed, the bottom of an absorption trench shall be at least:

- 36 inches above the seasonal high water table,
- 36 inches above any impervious soil layer, and
- 48 inches above bedrock.

On sloping sites, the measurements shall be taken from the deepest portion of the absorption trench.

The bottom of any absorption trench shall be level.

Absorption trenches shall have crushed stone extending a minimum of two inches above and 12 inches below the distribution pipe. Absorption trench systems may be constructed using prefabricated leaching cambers with a minimum of H-10 structural loading rate, instead of crushed stone. Distribution pipe must be used in any chamber system.

The distribution piping must be four inch rigid, perforated pipe that is laid level, or small diameter pipe under pressure. If the distribution piping is more than 100 feet in length, it must be dosed. The ends of the pipes must be capped.

A layer of non-woven geotextile shall be placed over the top of the crushed stone.

Each absorption trench shall be covered with a minimum of six inches and a maximum of 12

inches of permeable soil, with the uppermost 2 inches to 4 inches being topsoil.

Absorption trenches shall be designed at least six feet on center when measured on a horizontal plane, but in no case shall there be less than four feet of naturally occurring, undisturbed soil between adjacent absorption trenches. Primary and replacement absorption trenches may be interfingered. There shall be at least four feet of naturally occurring, undisturbed soil between the primary and replacement absorption trenches.

Absorption trenches on sloping ground shall be laid parallel to the ground contours.

A distribution box shall be installed when multiple absorption trenches are used. Flow equalization devices that can be adjusted to maintain equal distribution during the life of the wastewater system shall be installed in the pipes leading to each absorption trench. The distribution box shall be constructed with an at-grade access. The designer shall consider the need for protection against freezing and shall include design details as needed.

A reduction in the leachfield area may be allowed for absorption trenches, where the depth of crushed stone exceeds the normal 12 inch depth below the distribution pipe, as follows:

Table 2. Percentage of Standard Disposal Field Area Required for Absorption Trenches

Depth of Crushed Stone Below Distribution Pipe	Trench Width (Inches)				
	12	18	24	36	48
18 Inches	60%	64%	66%	71%	75%
24 Inches (Max)	50%	54%	57%	62%	66%

No absorption trench shall be constructed in fill material.

Absorption trenches shall not be constructed in soil with a percolation rate that is slower than 60 minutes/inch. Construction of absorption trenches in soils with a percolation rate that is faster that 1 minutes/inch requires approval of the state conservation engineer.

All piping from the building or structure to the grease/solids traps, from the grease/solids traps to a distribution box, or to a pump or siphon chamber, and to the absorption trench shall be non-perforated, rigid pipe. The pipe penetrations shall be sealed to prevent leakage.

After the absorption trench area has been excavated, any smeared surfaces shall be scarified with a rake. Construction equipment not needed to construct the leachfield shall be kept off the area to be used to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. If a fragment of soil from about 9 inches below the surface can be easily rolled into a wire, the soil moisture content is too high for construction purposes.

Additional Criteria for Absorption Beds

All absorption bed systems shall comply to all isolation requirements set forth in Table 1.

Leachfields that are wider than 48 inches are referred to as absorption beds.

The basis of design is the bottom area of the absorption bed. No reduction in area is allowed for extra stone under the distribution pipe.

An absorption bed shall not be constructed in soils with a percolation rate slower than 60 minutes/inch. An absorption bed constructed in soils with a percolation rate faster than 1 minute/inch requires approval of the state conservation engineer.

When installed, the bottom of the absorption bed shall be at least:

- 36 inches above the seasonal high water table,
- 36 inches above any impervious soil layer, and
- 48""above bedrock.

On sloping sites the measurements shall be taken from the deepest portion of the absorption bed.

The bottom of the absorption bed shall be level.

Absorption beds on sloping ground shall be laid parallel to the contour.

A large length to width ratio is recommended.

Absorption beds shall have a minimum of two inches of crushed stone over the distribution piping and a minimum of 6 inches of crushed stone below the distribution piping.

All distribution piping shall be laid level. The piping shall be 4 inch rigid, perforated pipe unless small diameter pipe under pressure is used. Any length of pipe greater than 100 feet shall be dosed.

Absorption bed systems may be constructed using prefabricated leaching chambers with a minimum H-10 structural loading rate, instead of crushed stone. Distribution pipe must be used in any chamber system.

There shall be a layer of non-woven geotextile over top of the crushed stone.

Each absorption bed shall be covered with a minimum of 6 inches and a maximum of 12 inches of permeable soil, with the uppermost 2 inches to 4 inches being topsoil.

Absorption beds shall not be constructed in fill material.

Absorption beds shall be sized on the bottom area only. The design shall be based on the second lowest percolation rate for the site. The loading rate shall be determined by the formula:

$$LR = 0.8\frac{3}{\sqrt{t}}$$

where LR is the loading rate in gallons per square foot of absorption bed per day and t equals the percolation rate in minutes per inch. The size of the absorption bed is determined by dividing the design flow in gallons per day by the loading rate in gallons per day per square foot. The result is the number of square feet of bottom area required. The minimum usable value for t is 4 minutes/inch and the maximum value for t is 60 minutes/inch. The maximum acceptable loading rate is 1.2 gallons per day per square foot.

Absorption beds shall not be installed on land with a slope greater than 10%.

All distribution lines within the absorption bed shall be uniformly spaced no more than six feet apart. The maximum distance from a distribution line and the edge of the absorption bed shall be three feet.

Primary and replacement absorption beds shall be separated by at least 10 feet.

All piping from the building or structure to the septic tank/grease trap, from the septic tank/grease trap to a distribution box, or to a pump or siphon chamber and to the absorption bed shall be non-perforated, rigid pipe. The pipe penetrations shall be sealed to prevent leakage.

After the absorption bed area has been excavated, any smeared surfaces shall be scarified with a rake. Construction equipment not needed to construct the leachfield shall be kept off the area to be used to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. If a fragment of soil from about 9 inches below the surface can easily be rolled into a wire, the soil moisture is too high for construction purposes.

Percolation Test Procedures

The following procedure is to be used for determining the percolation value required by this standard.

(a) Depth of Test – Tests shall be taken entirely within the most dense, least permeable soil identified within one (1) to three (3) feet below the bottom of the infiltrative surface of the proposed leach field.

(b) Type of Test Holes – The test hole will be unlined, shaped like a vertically oriented cylinder with a diameter of 6-8 inches and a depth of 10 inches.

(c) Preparation of Test Hole – Using a sharp instrument, carefully scrape the sidewalls of the hole to remove any smeared soil surface. This is particularly important in soils that have a significant silt or clay content. Place one (1) inch of clean crushed stone in the bottom of the hole to reduce scouring. When possible, instead of pouring water directly from a bucket into the hole, use a hose to siphon water out of a suitably located reservoir to provide a high degree of control over the rate of water entering the hole, to minimize scouring.

(d) Percolation Test Measurements – To begin the test, fill the hole with water up to a level six (6) inches above the stone and allow it to drop the distance specified in the table below for seven (7) consecutive runs. After each run, bring the water up to the six (6) inch level. The time of each run, the refill time between each run and the total elapsed time must be accurately recorded.

Table 3. Water Level Drops for Each Test Run of the Percolation Test Procedure

Soil Texture	Coarse to Medium Sand	Fine sand to Silt Loam	Silts to Clay
Anticipated Percolation Rate (min/in)	1 – 10	10 – 60	60 – 120
Drop (inches)	2	1	½

(e) Determining the Percolation Rate – The rate of drop for each run is plotted on graph paper with logarithmic scales on both axes (log/log graph paper) against the cumulative time of the seven runs, including the refill times. The best straight line is fitted to the seven data points and extrapolated out to one (1) day (1440 minutes) of the cumulative time. The drop after 1440 minutes is the percolation rate.

CONSIDERATIONS

The following shall be considered during design:

- On farm traffic patterns.
- Access to the milkhouse wastewater infiltration area components.
- Adjacent land uses and visibility.
- Location and height of air vents to avoid the odors that may be prevalent in the pipeline.
- Visual aesthetics to blend the system into the surrounding landscape.
- Site, soil, and environmental factors.
- Install submersible pump in grease trap for agitation and pumping fat cake to manure spreader.
- Install inline supplemental filter to trap additional fats and solids before reaching filter bed.
- To reduce maintenance and need to clean grease trap as frequently, exclude first rinse of wastewater from the infiltration area by feeding liquid to animals or by handling it with the manure.
- Install an alarm for the pump to alert operator of failure.
- This practice may adversely affect cultural resources. Planning, installation and maintenance must comply with GM 420, Part 401.

PLANS AND SPECIFICATIONS

Plans and specifications for installing milkhouse wastewater infiltration area shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of this practice, it's intended life, and the criteria for its design. The operation and maintenance plan shall address the following items:

- Safety procedures required for operation and maintenance of the facility.
- Periodic monitoring and cleanout of solid traps and any inline supplemental filters. Proper disposal shall be the manure storage facility, land application or other acceptable means.
- Maintain adequate vegetative cover on adjacent areas.
- Repair of damage to any earthfills, fences, pipes, and any other appurtenances.
- Maintain lids and openings to underground structures to ensure year-round access.
- Maintain grates on drains and subsurface drainage systems to ensure they are

functional and that rodent guards are in place.

- Ensure waste milk is not dumped into the milkhouse wastewater infiltration area.

REFERENCES

- VT ANR DEC, Environmental Protection Rules, Chapter 1. August 2002